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IS 11961 (1986): 4-metre Leveling Staff (Telescopic) [PGD
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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard
SPECIFICATION FOR
4-METRE LEVELLING STAFF
(TELESCOPIC)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR 4-METRE LEVELLING STAFF (TELESCOPIC)

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Indian Standard
**SPECIFICATION FOR
4-METRE LEVELLING STAFF
(TELESCOPIC)**

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 23 October 1986, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 The telescopic levelling staff is a mechanical device used in tertiary levelling to provide height control for topographical or engineering surveys. It consists of three sections out of which the top one slides into the middle section and the middle one into the bottom section.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

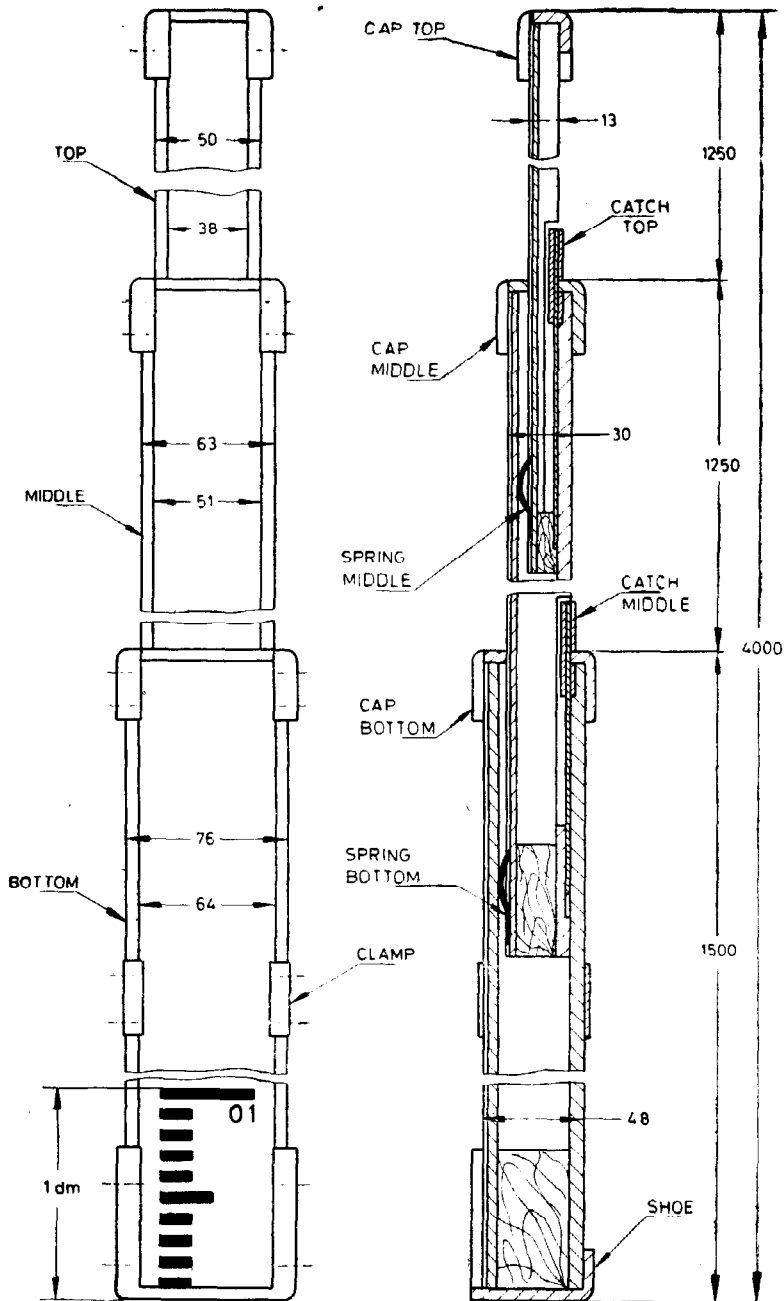
1. SCOPE

1.1 This standard covers the requirements of the 4-m levelling staff (telescopic).

2. NOMENCLATURE

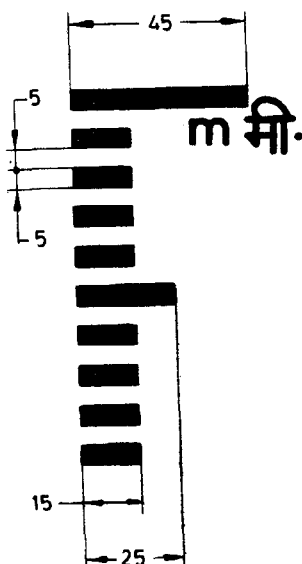
2.1 For the purpose of this standard, the nomenclature of the different parts of the levelling staff shall be as indicated in Fig. 1 to 9.

*Rules for rounding off numerical values (*revised*).



All dimensions in millimetres.

FIG. 1 4-METRE LEVELLING STAFF (TELESCOPIC)



All dimensions in millimetres.

FIG. 2 DETAILS OF GRADUATIONS

3. MATERIAL

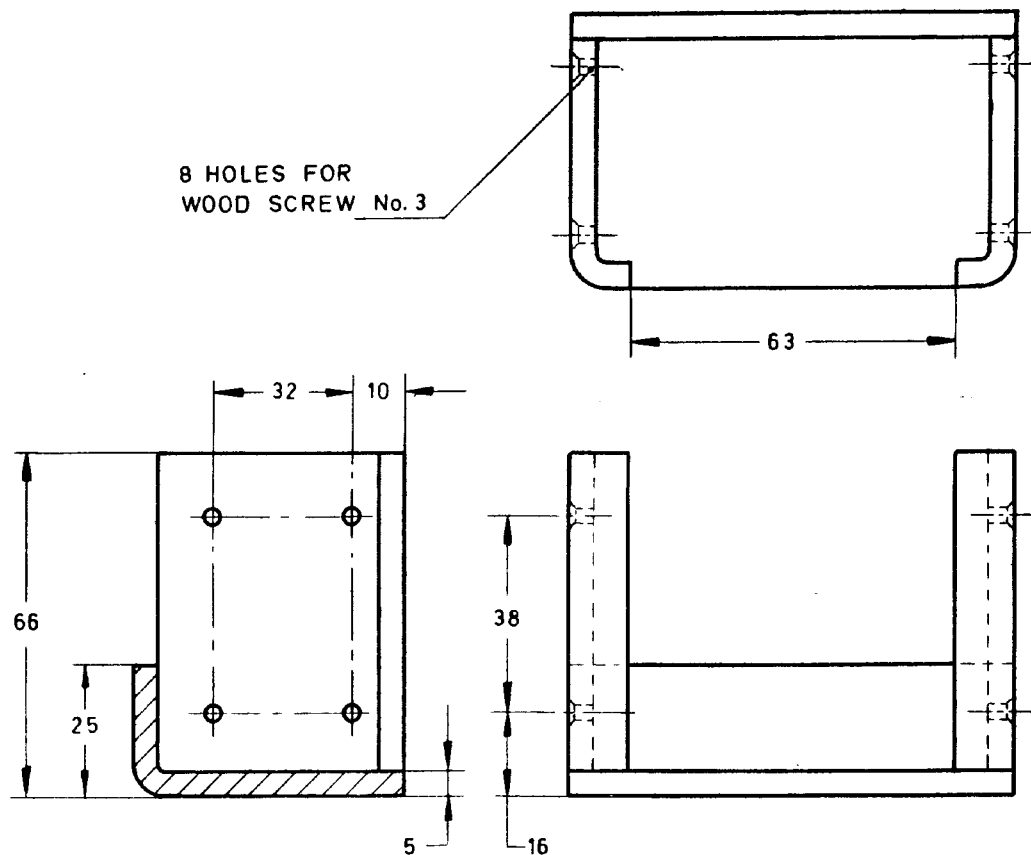
3.1 The staff shall be made of one of the following species of timbers (see IS : 7047-1973*):

<i>Botanical Name</i>	<i>Trade Name</i>
a) <i>Tectona grandis</i> Linn. f.	Teak
b) <i>Cupressus torulosa</i> Don.	Cypress
c) <i>Pinus Wallichiana</i> A.B. Jacks.	Kail
d) <i>Cedrus deodara</i> Loudon.	Deodar
e) <i>Artocarpus hiruta</i> Lamk.	Aini
f) <i>Michelia</i> sp.	Champ
g) <i>Terminalin myriocarpa</i>	Hollock

3.2 The timber shall be thoroughly seasoned and radially sawn. It shall be free from defects such as knots, cracks; shakes, insect attack and decay, etc. The moisture content shall be in the range of 8-12 percent (see IS : 287-1973†).

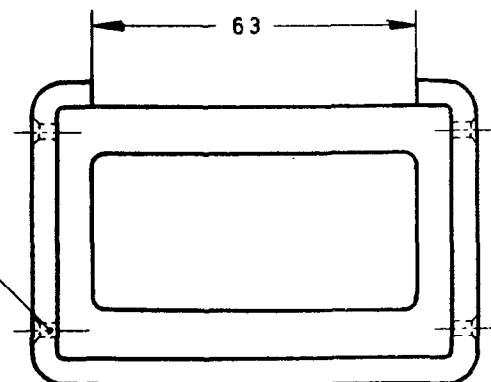
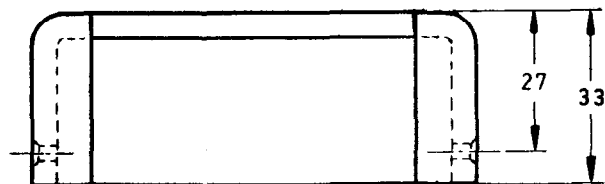
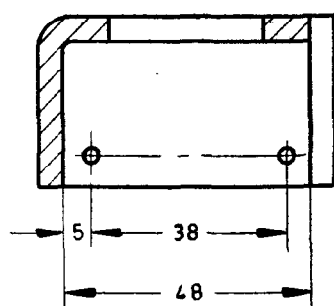
†Specification for timbers used in instrument industry.

*Recommendations for maximum permissible moisture content for timber used for different purposes (second revision).



All dimensions in millimetres.

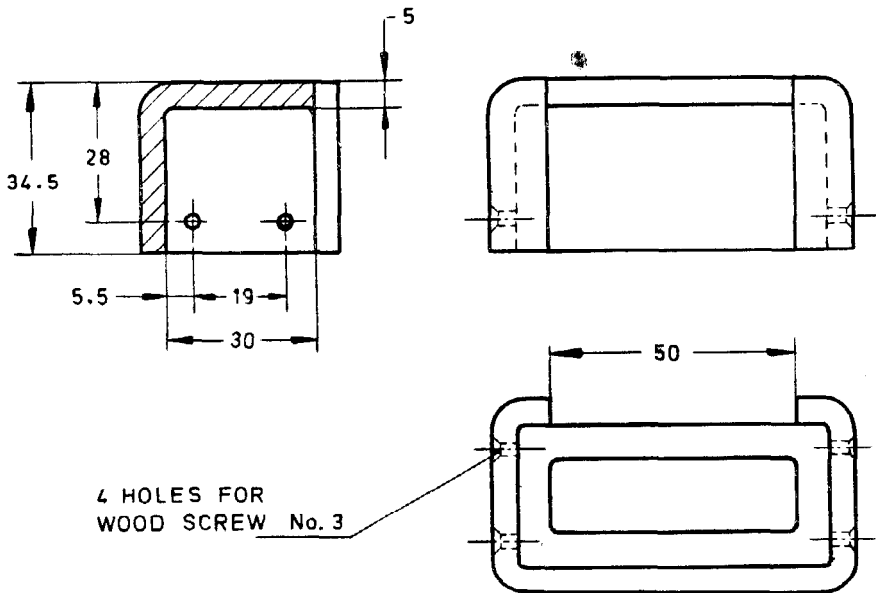
FIG. 3 DIMENSIONS FOR SHOE FOR LEVELLING STAFF



4 HOLES FOR
WOOD SCREW No. 3

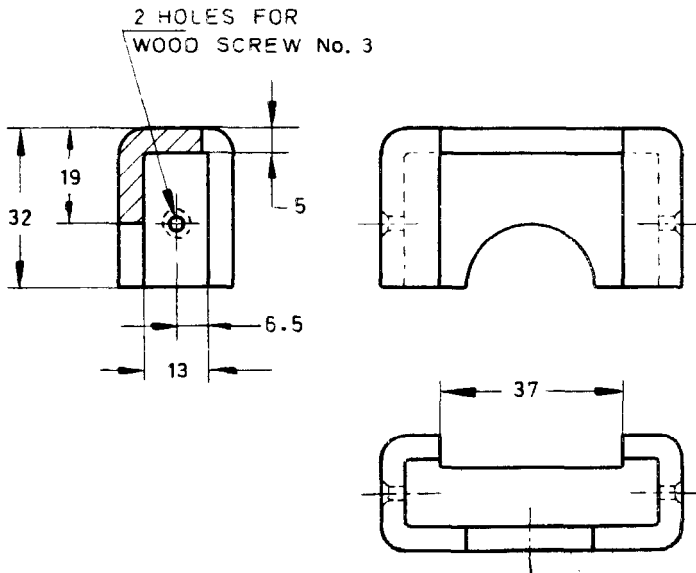
All dimensions in millimetres.

FIG. 4 DIMENSIONS FOR CAP, BOTTOM FOR LEVELLING STAFF



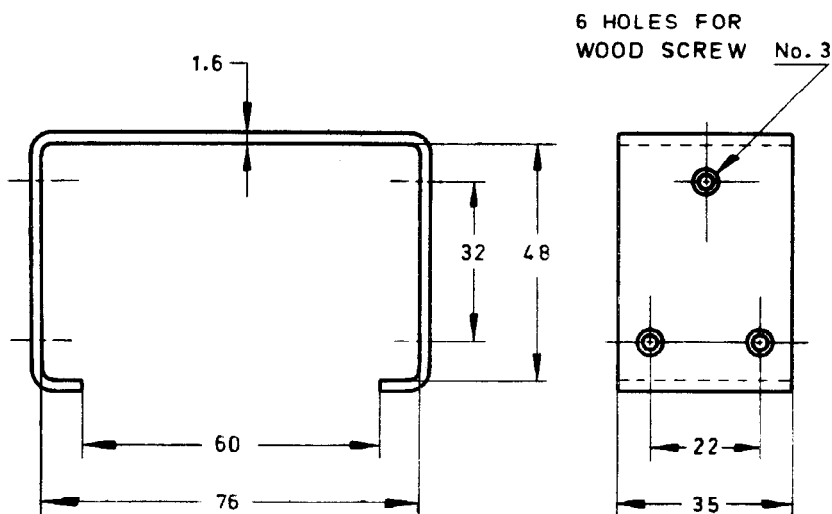
All dimensions in millimetres.

FIG. 5 DIMENSIONS FOR CAP, MIDDLE FOR LEVELLING STAFF



All dimensions in millimetres.

FIG. 6 DIMENSIONS FOR CAP, TOP FOR LEVELLING STAFF



. All dimensions in millimetres.

FIG. 7 DIMENSIONS FOR CLAMP, BOTTOM FOR LEVELLING STAFF

4. DIMENSIONS

4.1 The assembly and dimensions of levelling staff shall be as shown in Fig. 1.

4.1.1 A typical method of graduation and different dimensions shall be as shown in Fig. 2.

4.2 The detailed dimensions of different parts, such as shoe, cap clamp and catch shown in Fig. 3 to 9 are approximate for guidance only.

5. CONSTRUCTIONAL DETAILS

5.1 Staff

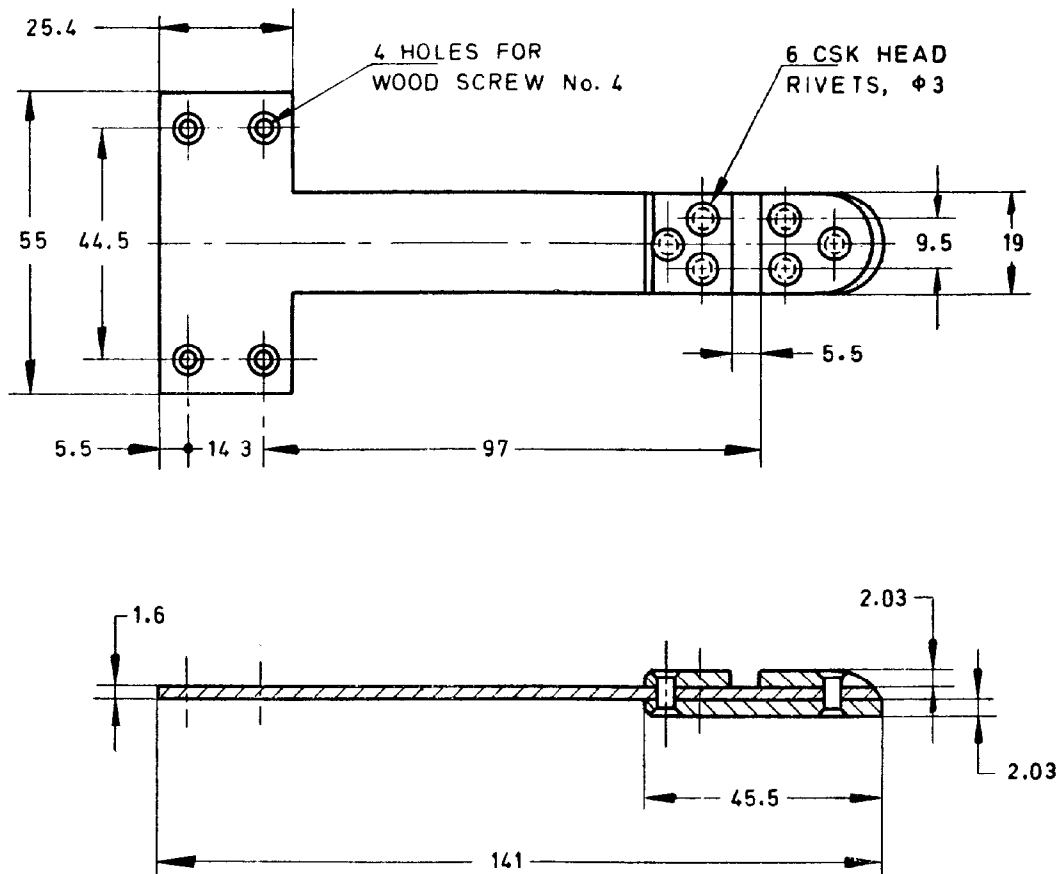
5.1.1 The staff shall be of telescopic construction comprising three sections as shown in Fig. 1. Each section shall be made of one longitudinal box construction (except the topmost section) without any joint in length.

5.2 Shoe (see Fig. 3)

5.2.1 The shoe shall be made of brass conforming to grade 3 of IS : 292-1983* or of aluminium alloy conforming to grade A6 of IS : 617-1975†.

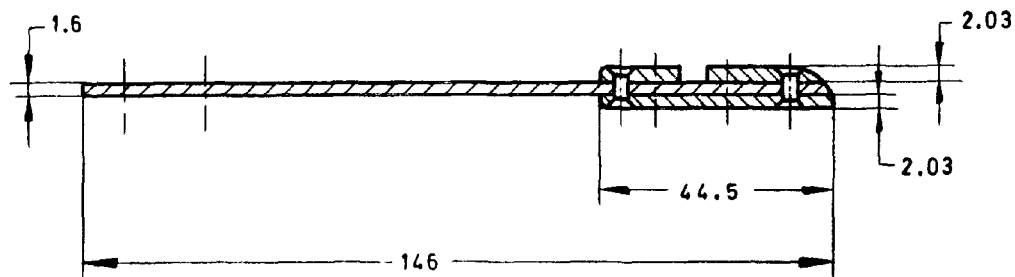
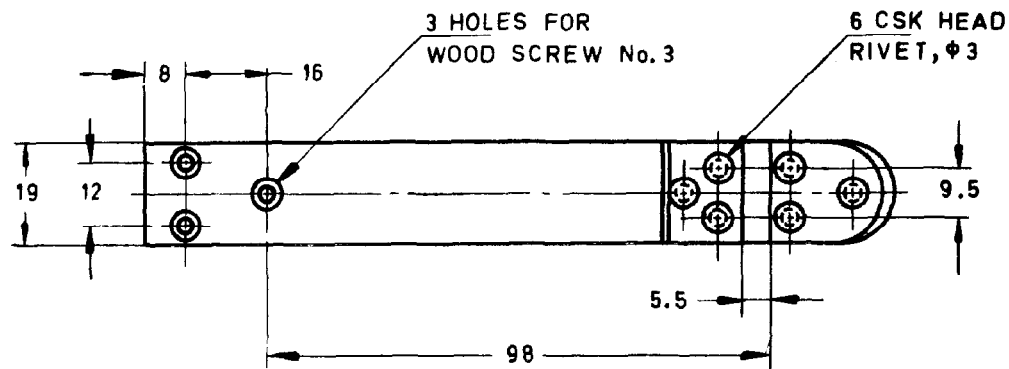
*Specification for leaded brass ingots and castings (second revision).

†Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes (second revision).



All dimensions in millimetres.

FIG. 8 DIMENSIONS FOR CATCH, MIDDLE FOR LEVELLING STAFF



All dimensions in millimetres.

FIG. 9 DIMENSIONS FOR CATCH, TOP FOR LEVELLING STAFF

IS : 11961 - 1986

5.2.2 The base of the shoe, that rests on the ground, shall be fine machined.

5.2.3 Except the base, the other portion of the shoe shall be painted black or anodized and dyed black.

5.3 Cap (see Fig. 4 to 6)

5.3.1 The cap shall be made of aluminium alloy conforming to grade A6 of IS : 617-1975*. It shall be painted black or anodized and dyed black.

5.4 Clamp (see Fig. 7).

5.4.1 The clamp shall be made of steel conforming to IS : 226-1975† or of aluminium sheet conforming to grade SiC of IS : 737-1974‡. It shall be painted black or anodized and dyed black.

5.5 Spring

5.5.1 The staff shall be provided with two springs, one in second and the other in third section, for having a smooth telescopic action and to actuate the catch to operate. The spring shall be made of spring steel conforming to IS : 2507-1975§. It shall be hardened, tempered and phosphatized.

5.6 Catch (see Fig. 8 and 9)

5.6.1 Catch shall be used to hold the extended section of the staff to remain in position without slipping. It shall be made of steel conforming to IS : 226-1975†. It shall be phosphatized.

5.7 Wood Screws

5.7.1 All wood screws shall be made of rust proof material preferably brass conforming to Alloy 1 of IS : 320-1980||.

6. ACCESSORIES (OPTIONAL)

6.1 The staff shall be provided with a circular bubble conforming to IS : 1632-1960¶ suitably cased, of sensitivity of 25 minutes per 2 mm run. The cased bubble shall be fixed at a convenient height and suitably protected from damage during transit.

6.2 The staff may have fittings for plummet used to test and correct the bubble.

*Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes (*second revision*).

†Specification for structural steel (standard quality) (*fifth revision*).

‡Specification for wrought aluminium and aluminium alloys, sheet and strip (for general engineering purposes) (*second revision*).

§Specification for cold rolled steel strip for springs (*first revision*).

||Specification for high tensile brass rods and sections (other than forging stock) (*second revision*).

¶Specification for bubbles

6.3 The staff may be provided with a canvas carrying case/bag.

7. GRADUATIONS

7.1 Each metre shall be subdivided into 200 divisions, the thickness of divisions (black and white) being alternately 5 mm each.

7.2 The graduations shall be continuous and in the same line when the staff is fully extended to read 40 decimetres (4 metres) exactly from the ground.

7.3 Every decimetre length shall be figured with the corresponding numerals, the metre numerals being in red and decimetre numerals in black.

7.4 The graduations shall be painted with suitable white, black and red colour which shall not crack or blister on exposure to adverse atmospheric conditions. Alternatively, the graduations may be silk screen printed on a white plastic sheet, not less than 0.5 mm thick and pasted with suitable adhesive on the staff face. The adhesive shall not deteriorate and dislodge the sheet from position and show no evidence of buckling.

7.5 The graduated lines shall always be parallel to the base of the shoe and perpendicular to the length of the staff.

7.6 The graduations shall be clear and distinct and shall have adequate contrast.

7.7 The edges of the graduations shall be straight and sharply defined when seen with a tertiary level having about $25\times$ magnification at a distance of approximately 10 metres.

8. FINISH

8.1 Before being graduated, the staff shall be treated with a suitable fungicide, such as solution of pentachlorophenate and shall be thoroughly dried. It shall be subjected to suitable treatments to minimize effects due to humidity.

8.2 In case of spray painting, the staff shall first be given an undercoat of cellulose paint and then treated to provide a smooth white surface for the second coat. On this second coat the graduations shall be marked with dull black.

8.3 The other surfaces shall be polished and a coat of weather resistant varnish shall be applied.

8.4 All metal parts, specially steel parts, shall be suitably treated to prevent corrosion.

9. ACCURACY

9.1 The graduations shall have accuracy of ± 1 mm over the full length of 4 metres or a part thereof.

10. FUNCTIONAL REQUIREMENTS

10.1 The movement of the middle and top sections shall be easy and smooth.

10.2 The staff, in its fully extended condition, shall be stable and straight and shall not wobble even in strong wind.

10.3 The weight of the staff shall not exceed 4 kg with its all fittings.

11. TESTS

11.1 The staff shall be tested to conform to the requirements mentioned in 3 to 9.

11.2 The graduations shall be tested to conform for accuracy with a calibrated and certified steel tape.

11.3 In order to test the horizontality of graduations, the staff shall be allowed to rest vertically (without any support) on a level ground and the graduations checked with the horizontal cross line of a tertiary level. It shall be ensured that the graduations are parallel to the horizontal cross-line.

12. MARKING

12.1 The staff shall be indelibly marked with the manufacturer's name or trade-mark and year of manufacture.

12.2 The abbreviation 'm' (metre), to indicate that graduations have been done in metric system of units, shall be suitably marked towards the foot of the bottom section in red. The letter (मी) shall also be written alongside 'm'.

12.3 The staff may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

13. PACKING

13.1 Each levelling staff shall be suitably packed for transit to avoid any damage to the staff on its graduations.